Bacterial Wilt and Stewarts Leaf Blight of Corn

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COMMONWEALTH MYCOLOGICAL INSTITUTE
- 4 SEP 1968

Farmers' Bulletin No. 2092
U.S. DEPARTMENT OF AGRICULTURE

BACTERIAL WILT and STEWARTS LEAF BLIGHT OF CORN

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Bacterial wilt in sweet corn and Stewarts leaf blight in dent corn can cause serious losses for corn growers.

Although bacterial wilt is most severe on sweet corn, it also attacks dent, flint, flour, and popcorn varieties. The organism [1] that causes this disease also causes Stewarts leaf blight, a serious disease of dent corn.

The use of resistant sweet corn varieties and hybrids minimizes losses from bacterial wilt. Most of the dent corn hybrids are resistant to bacterial wilt; however, some are subject to Stewarts leaf blight.

DISTRIBUTION

Bacterial Wilt.—This disease occurs throughout the corn-growing areas of the United States.

It also occurs to some extent from Long Island to Virginia, down into the Southern States, and westward through the Corn Belt.

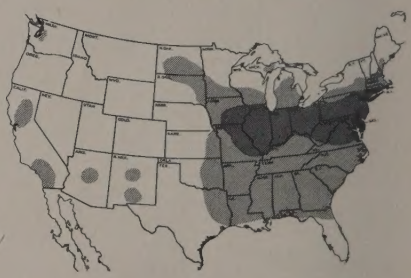
The extent of bacterial wilt decreases from south to north in the Corn Belt, and only when the disease is abundant throughout the Central States is it found very far north of the Corn Belt. However, severe outbreaks of bacterial wilt sometimes occur on susceptible early sweet corn in the Northeastern and Central States. Bacterial wilt losses of sweet corn are minor in the Southern States.

Stewarts Leaf Blight.—This disease occurs in the same regions as bacterial wilt. In the South, however, it is found only in isolated fields. It occurs commonly throughout the Central and Northeastern States.

Increasingly heavy attacks of Stewarts leaf blight may occur in several successive years after which the disease may appear mildly.

DEVELOPMENT

The bacteria enter corn plants through leaf wounds that are made chiefly by corn flea beetles (fig. 1).



Geographic distribution of bacterial wilt and Stewarts leaf blight of corn in the United States. Heavy shading indicates areas in which these diseases are more serious.

[1] *Xanthomonas stewartii.*

(Infected seed also can cause young seedlings to be affected.) Once inside the leaf, the bacteria can multiply until they fill the water-conducting vessels of the veins of the leaf. This causes streaks (dead tissues) in the leaf, a condition known as Stewarts leaf blight.

If the bacteria spread through the leaf veins into the stalk, they

Figure 1.—Feeding injuries on leaves of corn plants caused by corn flea beetles: *A*, Plant from inbred line of yellow dent corn with feeding injuries but no bacterial wilt or Stewarts leaf blight; *B*, section of corn leaf showing flea beetles and conspicuous feeding channels (enlarged 8 times).

Figure 2.—Susceptible Golden Bantam sweet corn heavily infected with bacterial wilt, showing stunted plant, wilting of top, and long streaks on leaves.

can prevent the plants from getting water and food materials and thus cause bacterial wilt. The bacteria can spread through the stalk into the tassel and ear, and can infect the entire plant.

SYMPTOMS

Bacterial Wilt

Susceptible sweet corn varieties are subject to infection with bacterial wilt throughout their growth. Young infected plants often wilt as if suffering from lack of water. Green corn leaves dry up one after another and the whole plant may wilt and die, even though there is plenty of moisture in the soil. Those that do not die are stunted, tassel prematurely, and produce no ears or, at most, only nubbins.

Infected leaves show long, wilted, pale-green streaks that have wavy edges (figs. 2 and 3). The streaks often turn pale yellow and center tissues die. The streaks start from flea beetle feeding injuries, spread along the veins into the stalk, and can dwarf or kill the entire plant. The vascular bundles (water-conducting channels) of the stalks may

become so filled with bacteria that, when the stalks are cut, masses of bacteria ooze out as yellow, moist beads on the cut ends (fig. 4). Bacteria also can spread into the tissues along the vascular bundles of the stalks and form cavities in the pith. Often the basal node is darkened.

Ears can also become infected (fig. 5). Usually only part of the kernels are affected, but on heavily infected ears all kernels can be damaged. The bacteria spread through the shank and cob into the interior of the kernels. They also may ooze out in tiny drops on the inner sur-

Figure 3.—Susceptible Golden Bantam sweet corn leaves, showing streaking of leaves caused by bacterial wilt.

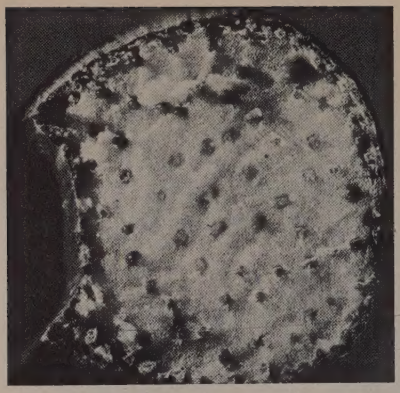


Figure 4.—Cross section of a stalk of sweet corn infected with bacterial wilt, showing beads of bacterial ooze coming from the water-conducting channels in tiny droplets.

faces of the husks and become smeared over the kernels. Small, irregular water-soaked spots on the inner and outer husks later become dried and darkened.

Dent corn hybrids are more resistant to bacterial wilt than sweet corn. In spite of flea beetle feeding damage, only a few dent corn hybrids become infected and very few develop bacterial wilt. Ears and stalks of dent corn hybrids in common use do not become infected by the bacterial wilt organism.

Stewarts Leaf Blight

On susceptible dent corn, Stewarts leaf blight shows conspicuous streaks on the leaves (fig. 6). The streaks generally appear when the plants are in tassel; however, they may develop on younger plants. They first are light green to yellow and extend along the leaf veins and have wavy edges. They later turn tannish brown, and dry. When the streaks are numerous, they merge and large areas of the leaf are affected. Sometimes entire leaves die and dry up. This premature firing (or dying of leaves), while the stalks remain green, gives the plants the appearance of having suffered frost damage (fig. 7).

On resistant dent corn, the streaks are less abundant and considerably smaller than on susceptible dent corn. Often only small oval spots 1 or 2 inches long develop.

When infection occurs early in the season, the lower leaves usually are infected first, and the disease progresses upward. When infec-

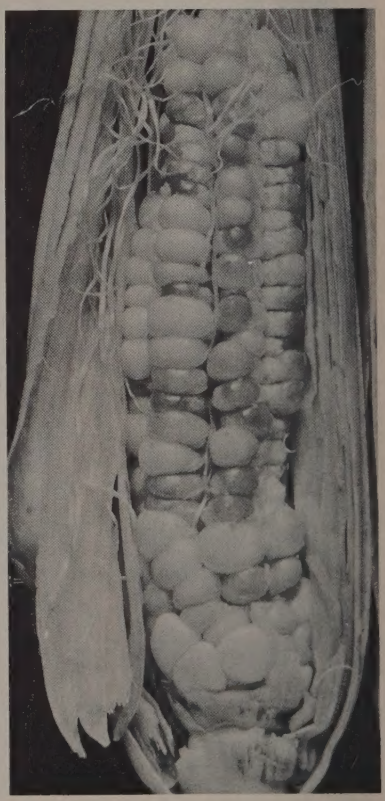


Figure 5.—Ear of sweet corn infected with bacterial wilt; part of the kernels are diseased.

tion occurs late in the season, symptoms develop on the more tender top leaves. Infection in the leaves rarely spreads into the stalk and other parts of the plant.

If leaf blight is severe, much of the leaf tissue is killed and yield is reduced. The weakened plants also are more susceptible to stalk rots.

Some sweet corn hybrids develop Stewarts leaf blight even if they are somewhat resistant to bacterial wilt.

Other Leaf Blights of Corn

Symptoms of Stewarts leaf blight differ distinctly from those of other leaf blights on corn. In bacterial leaf blight [2] stripes or spots on corn leaves are long and narrow and have reddish-brown edges. Badly streaked leaves shred readily, particularly in rain or wind (fig. 8, *A*). Upper leaves can be attacked as readily as the older lower leaves. Sometimes this disease is accompanied by a rot of the upper stalk.

The lesions of bacterial stripe [3] are long, narrow, and generally parallel stripes. They first are olive green, later turn yellowish brown, and often appear water-soaked (fig. 9). Under severe infection, most of the leaves below the ear are killed. The upper leaves then may develop pale yellow to white stripes. If the stripes on the upper leaves continue to develop, they blend together until the uppermost leaves are entirely bleached. The bleached tops are characteristic symptoms of the disease, but they do not contain the bacterium.

The symptoms of northern corn leaf blight [4] on corn leaves are large, spindle-shaped (or oval), grayish-green to tan spots (fig. 8, *B*). In severe attacks, these spots blend together and much of the leaf is killed. The disease is similar to Stewarts leaf blight—it progresses

[2] Caused by the bacterium *Pseudomonas alboprecipitans.*

[3] Caused by the bacterium *Pseudomonas andropogonis.*

[4] Caused by the fungus *Helminthosporium turcicum.*

Figure 6.—Leaf of dent corn showing streaks of Stewarts leaf blight.

Figure 7.—Rows of dent corn showing the general appearance of firing of the leaves of plants heavily infected with Stewarts leaf blight.

from the lower leaves upward, attacks dent corn late in the season, and causes the leaves to become fired when attacks are heavy. Generally, sweet corn is attacked earlier and more severely than dent corn. Entire fields may appear to be fired.

The symptoms of southern corn leaf blight [5] and corn leaf spot [6] are small, well-defined, tan to brown

[5] Caused by the fungus *Helminthosporium maydis.*

[6] Caused by the fungus *Helminthosporium carbonum.*

spots (fig. 8, *C* and *D*). Both of these fungus diseases cause a firing of the leaves when the attacks are severe.

Streaks of Stewarts leaf blight can occur on corn leaves along with one or more of these diseases.

OVERWINTERING

The bacterial wilt and Stewarts leaf blight bacterium overwinters almost exclusively in the corn flea beetle, which carries the bacterium to young corn plants in the spring

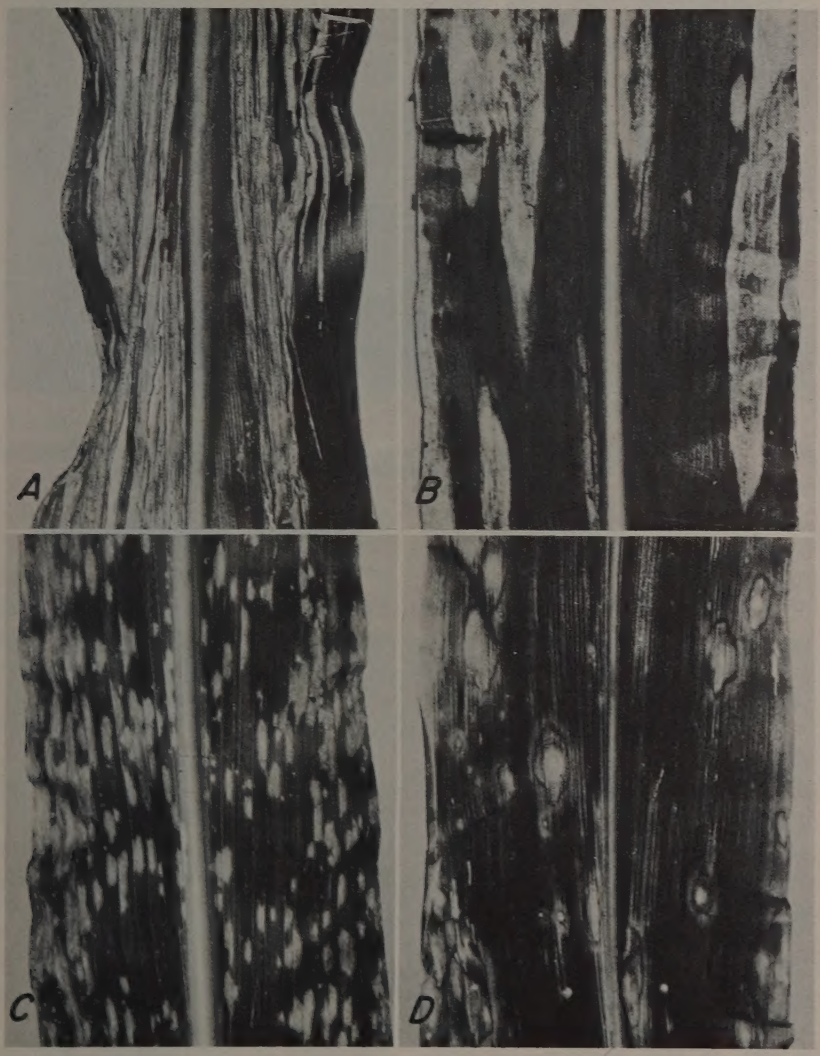


Figure 8.—Other leaf blights of corn that are different from Stewarts leaf blight: *A*, Bacterial leaf blight; *B*, northern corn leaf blight; *C*, southern corn leaf blight; and *D*, corn leaf spot.

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Figure 9.—Bacterial stripe: *A*, Typical narrow linear lesions on lower leaves; *B*, striped bleached leaves, which are not infected, develop after severe infection on lower leaves.

soon after the corn comes up. The adult beetles come out of hibernation as the weather becomes warm in April and May and begin to feed on growing corn or other plants. Infection can spread rapidly from such feeding areas.

The bacteria probably live in seed for several months. Infected seed, therefore, may spread the disease into uninfected regions. However, only about 2 percent of the plants develop bacterial wilt when infected kernels are planted. Infected seed, therefore, cannot account for the heavy disease attacks that sometimes occur early in the season.

The bacteria occasionally overwinter in soil, manure, or cornstalks, but severe infection does not come from these sources.

WINTER TEMPERATURE

The extent of bacterial wilt and Stewarts leaf blight in the Central and Northeastern States is affected by the temperatures of the previous winter. A heavy outbreak of bacterial wilt on sweet corn is not likely to develop when the average temperature for December, January, and February totals less than 100° F.

Dent corn usually escapes severe attacks of Stewarts leaf blight when this total average is not more than 85°. In the Northern States, the diseases can be greatly reduced by one severe winter. Farther South, however, a series of cold winters is necessary to significantly decrease damage. Several successive mild winters tend to build up bacterial

wilt and Stewarts leaf blight to epidemic proportions.

SPREAD

The first young corn plants to become infected with bacterial wilt are those attacked by overwintered corn flea beetles that carry the bacteria in their bodies.

Other corn flea beetles that are not carrying the bacteria also feed on the infected plants. Then they get the bacteria into their bodies and carry them to other corn plants on which they feed. New broods increase the number of beetles. The disease thus becomes more general in a locality as the season advances. The beetles can migrate or be carried by air currents considerable distances to start infections in other fields.

The beetles carry and transmit the bacteria as long as they live. They carry the bacteria to dent corn in the summer to start Stewarts leaf blight. Although only about 10 to 20 percent of the beetles coming out of hibernation in the spring carry the bacteria, up to 75 percent of the beetles feeding on corn in midsummer may be carriers. Heavy leaf infections appear on dent corn at this time or soon thereafter.

CONTROL

The growing of resistant hybrids or varieties is the only practical method of controlling bacterial wilt and Stewarts leaf blight.

For varieties and hybrids that are adapted to your location and suitable for your purpose, ask your State agricultural experiment station specialist or obtain a free copy of Farmers' Bulletin 2042, "Commercial Growing of Sweet Corn," from your county agricultural agent or the U.S. Department of Agriculture, Washington, D.C. 20250. Send your request to the Department on a post card. Please include your ZIP Code.

Surface treatment of seed is not an effective control measure, since the bacteria are inside infected seed.

Figure 10.—Rows of sweet corn showing varieties susceptible (left) and resistant (right) to bacterial wilt.

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However, transmission through the seed is responsible for so small a part of the field infections in the spring that it is of no practical importance. Field infections start from feeding injuries made by flea beetles that carry the bacteria.

Corn flea beetles can be controlled early in the growing season by chemical spraying. Control of early-generation flea beetles lessens the seriousness of the infection and delays its development. Controlling the bettles throughout the growing season is not practical.

For information on chemical control of corn flea beetles, consult your county agricultural agent or your State agricultural experiment station.

Sweet Corn.—Some varieties and hybrids of sweet corn are resistant to bacterial wilt (fig. 10). Early-maturing varieties of all types of corn generally are more susceptible to bacterial wilt than are late varieties.

Practically all white sweet corn hybrids that contain lines of Country Gentleman and Stowell Evergreen are resistant to bacterial wilt.

Dent Corn.—Inbred lines that make up hybrids of dent corn and hybrids themselves show differences in susceptibility and resistance to Stewarts leaf blight. Even though specific breeding for resistance to this disease has not been done and the hybrids in use have not been tested under heavy epidemic conditions, some are known to show more resistance than others.

No specific hybrids of dent corn are known to be immune to Stewarts leaf blight, but some have good resistance to the disease.

Some dent corn inbred lines, particularly early ones, are susceptible to bacterial wilt. Most of the dent corn hybrids adapted in the Corn Belt and in other areas are resistant to general infection.

Popcorn.—Popcorn varieties also show differences in susceptibility to bacterial wilt, although information on them is limited.

Flour and Flint Corn.—Early varieties of flour and flint corns are susceptible to bacterial wilt, but, since they are grown only sparingly, the disease losses in these types of corn are not severe.

Washington, D.C. Revised March 1967

U.S. GOVERNMENT PRINTING OFFICE: 1967 O—234-451